Weather Spotter Training 2013

NOAA/National Weather Service Weather Forecast Office
Salt Lake City, UT

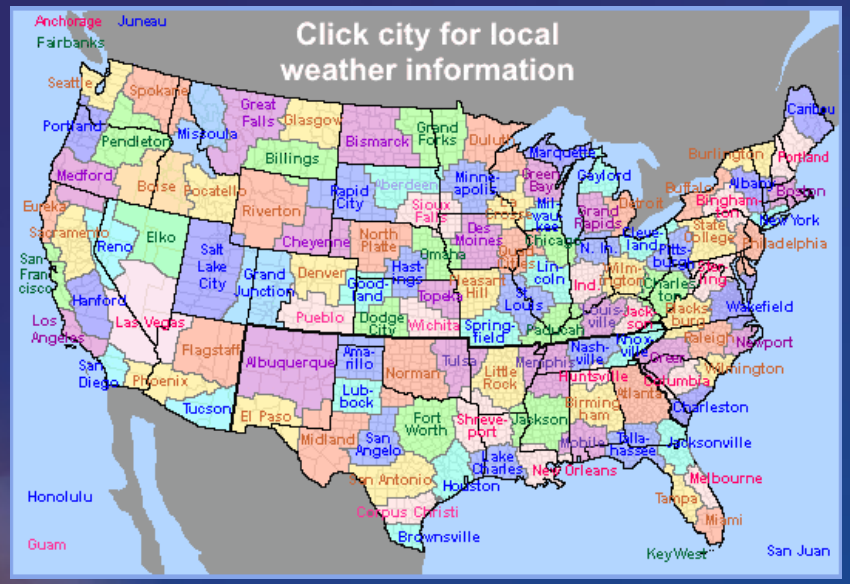
Goals of the Training

You will learn:

- Definitions of important weather terminology and extreme weather criteria
- How to correctly identify significant weather features and events
- What information the spotter is to report and how to report it
- Ways to receive weather information before and during extreme weather events
- Spotter Safety

Near Grantsville, UT - September 4, 2007

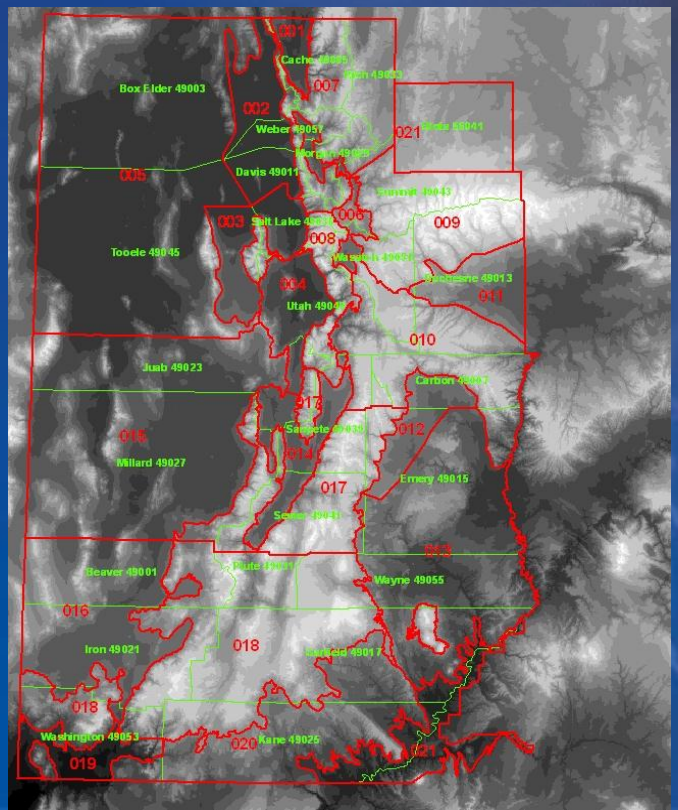
About the National Weather Service (NWS)



Provides weather, hydrologic, and climate forecasts and warnings for the protection of life and property and the enhancement of the national economy

Salt Lake City Weather Forecast Office (WFO) prepares and issues forecasts and warnings for 26 counties in Utah and extreme southwest Wyoming

24/7 Operation



Past Weather Events

Severe Thunderstorms

Floods/Flash Floods

Debris Flows

Winter Storms

Wildland Fires

Lightning

Windstorms

Severe Weather

Floods/Flash Floods

Truck being carried downstream in flash flood

Floods/Flash Floods

Lightning

- 1 lightning fatality in 2012 – Boulder Mountain
- 1 injury

Wildland Fires

Rosecrest Fire - June 2012

Pinyon Fire - August 2012

Quail Fire - July 2012

2012 Wildfire Statistics:

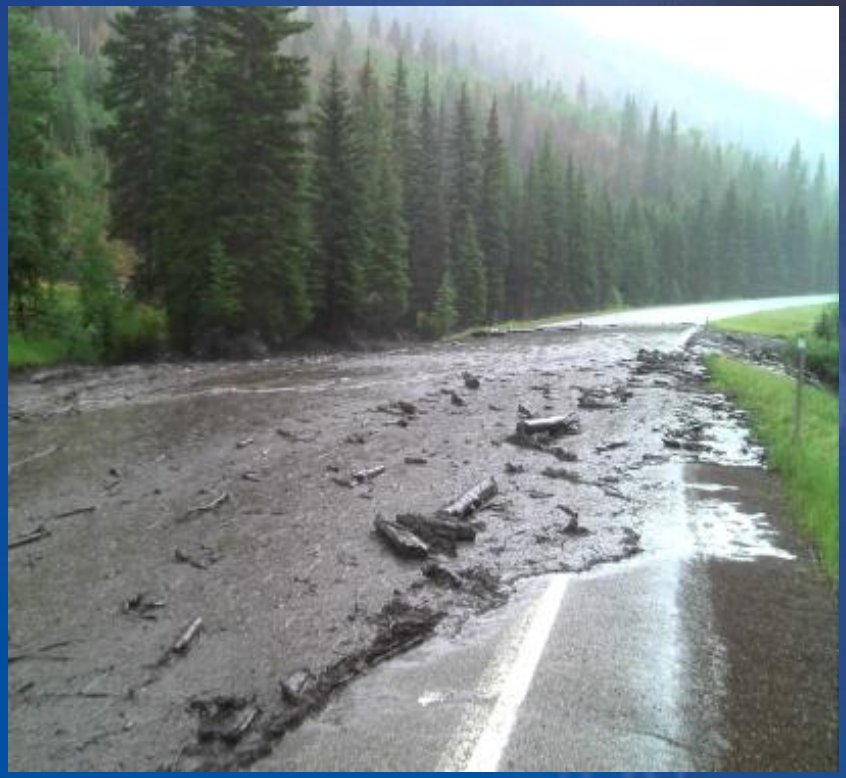
1 fatality - 466,000 acres burned - 1,453 fires reported

Debris Flows

Debris Flow from Seeley Fire

Huntington Canyon – Emery County

July 2012



Windstorms

Wasatch Front – December 1, 2011

- 102 mph wind gust recorded in Centerville
- $4 million damage to public infrastructure
- $78 million damage to insured property
- 50,000 homes and businesses without power
- Interstate closures
- School closures

Winter Storms

Salt Lake City International Airport

Northern Utah Freezing Rain Event
January 24, 2013

I-80 - Salt Lake City

Winter Storms

NWS Operations Before Weather Spotters

SKYWARN (Severe Weather) Spotters

Why are you critical to NWS operations?

- **Help overcome Doppler Radar limitations**
  - Extreme terrain leads to less than optimal radar coverage
  - Radar doesn't 'see' below cloud base
  - Radar is good at indicating circulations (mesocyclones), but most circulations are not associated with a tornado

- **Provide ground truth, which can help motivate people downstream to take action to protect lives and property**
  - Ground truth reports included in warnings heighten public awareness, add credibility to warnings, and allow forecasters to have confidence in warning decisions

- **Ground truth can be correlated with radar signatures *prior to*, *during*, *and* *after* severe weather to aid in warning decisions**
  - We archive severe weather events for research and verification and use a Weather Event Simulator for training with past weather events

Reporting…What We Want to Hear About

Don’t assume we already know it’s happening!

- Tornadoes, Funnel Clouds, and Wall Clouds
- Flooding/flash flooding and/or rapidly rising water
- Strong and/or damaging winds
- Hail
- Wildland fires
- Snowfall, snow depth, and freezing rain
- Marine-related weather events

Continue to monitor and report!

When You Report

4 Ws – who, what, when, and where

- **Identify yourself as a trained spotter (who)**
- **Describe severe weather feature (what)**
- **Provide exact time feature was spotted (when)**
  - This may or may not be the current time of your call
- **Be as specific as possible with location (where)**
  - Reference distance and direction from nearest city
  - Use interstate, state, or county road information
  - Reference marina, or other navigational information

Continue to monitor and report!

Reporting Options

Severe Weather Spotter Line:
800-882-1432 x1

Submit a Storm Report
http://www.srh.noaa.gov/StormReport/SubmitReport.php?site=slc

E-mail
utah.spotter@noaa.gov

Twitter
@NWSSaltLakeCity
http://twitter.com/#!/NWSSaltLakeCity
http://www.nws.noaa.gov/stormreports

Dust storm near Milford, UT

Facebook
US National Weather Service Salt Lake City Utah
http://www.facebook.com/US.NationalWeatherService.SaltLake.gov

The PING Project
Precipitation Identification Near the Ground

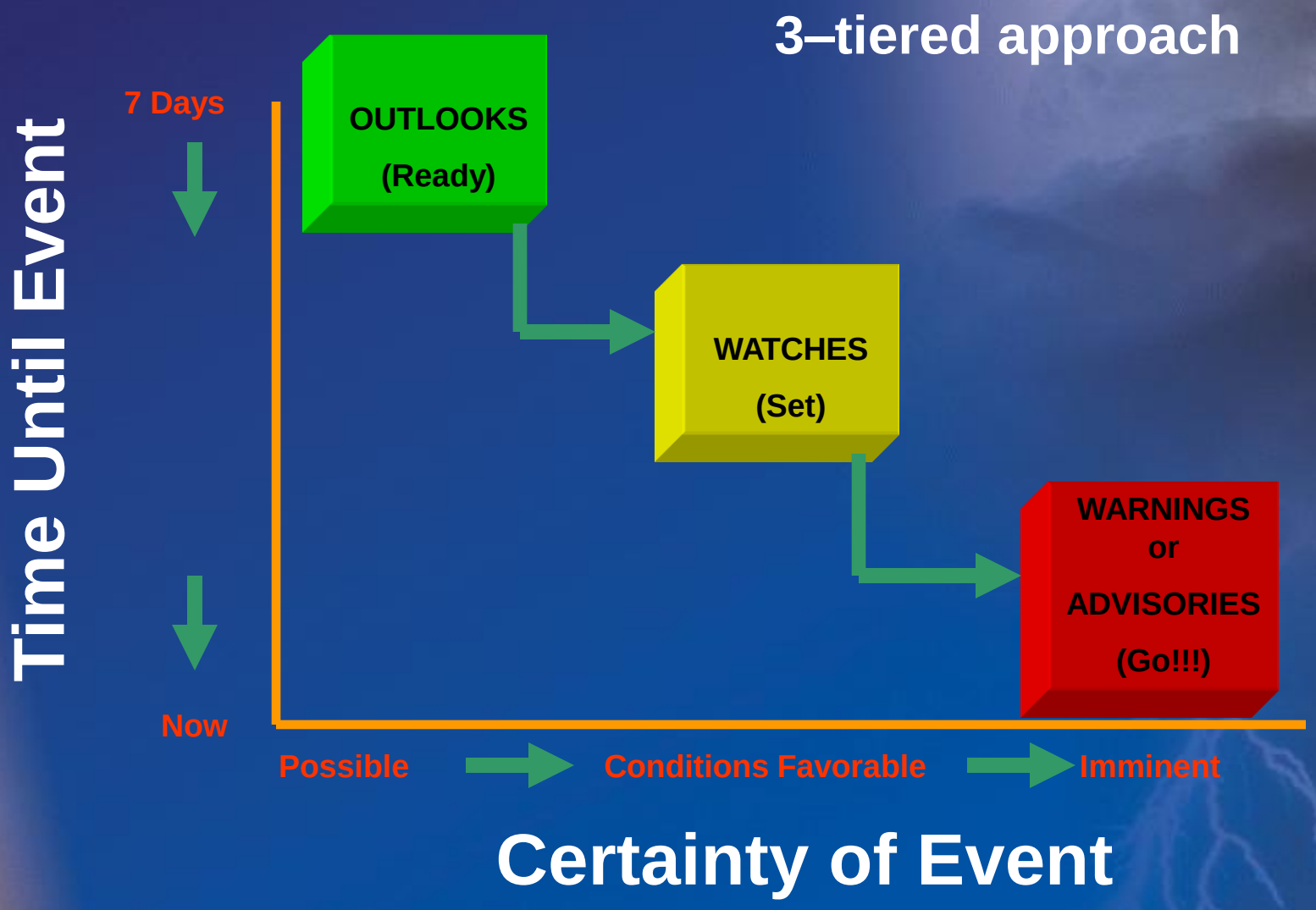
- NOAA National Severe Storms Laboratory, in partnership with the University of Oklahoma
- Reporting through mPING app, available on iTunes or Google Play, or Web at http://www.nssl.noaa.gov/projects/ping
  - Winter precipitation
  - Hail occurrence and hail size
- PING display at http://www.nssl.noaa.gov/projects/ping/display

Anticipating Severe Weather

Situational Awareness # 1 - Be aware of your environment!

Plymouth, UT - July 27, 2007

Ready…Set…Go!!!


3–tiered approach
Time Until Event
7 Days
Now
OUTLOOKS
(Ready)
WATCHES
(Set)
WARNINGS
or
ADVISORIES
(Go!!!)
Possible
Conditions Favorable
Imminent
Certainty of Event

Severe Weather Terms

What to watch for

- **Watch** - Issued when conditions are **favorable** for a particular severe weather hazard to develop during the next several hours. Plan, prepare, and be aware.`
- **Warning** - Issued when a particular severe weather hazard is either **imminent or occurring**, and poses a significant risk to life and/or property. Immediate action is necessary to protect life and/or property.
- **Advisory** – A low-impact event is imminent or occurring, which may result in inconvenience or nuisance weather conditions - primarily impacting travel. Reasonable precautions will prevent injury or property damage.

Anticipating Severe Weather
What to look and listen for…be Informed

- **Utilize WFO Salt Lake City web services http://weather.gov/saltlakecity**
  - **Text and graphical services**
    - **Dynamically generated forecasts**
    - **Hazardous Weather Outlook**
    - **Watches, warnings, and advisories**
  - **YouTube briefings**
  - **Weather Story**
  - **Social media**
  - **Radar imagery**
- **NOAA Weather Radio All Hazards**
- **Local media sources**

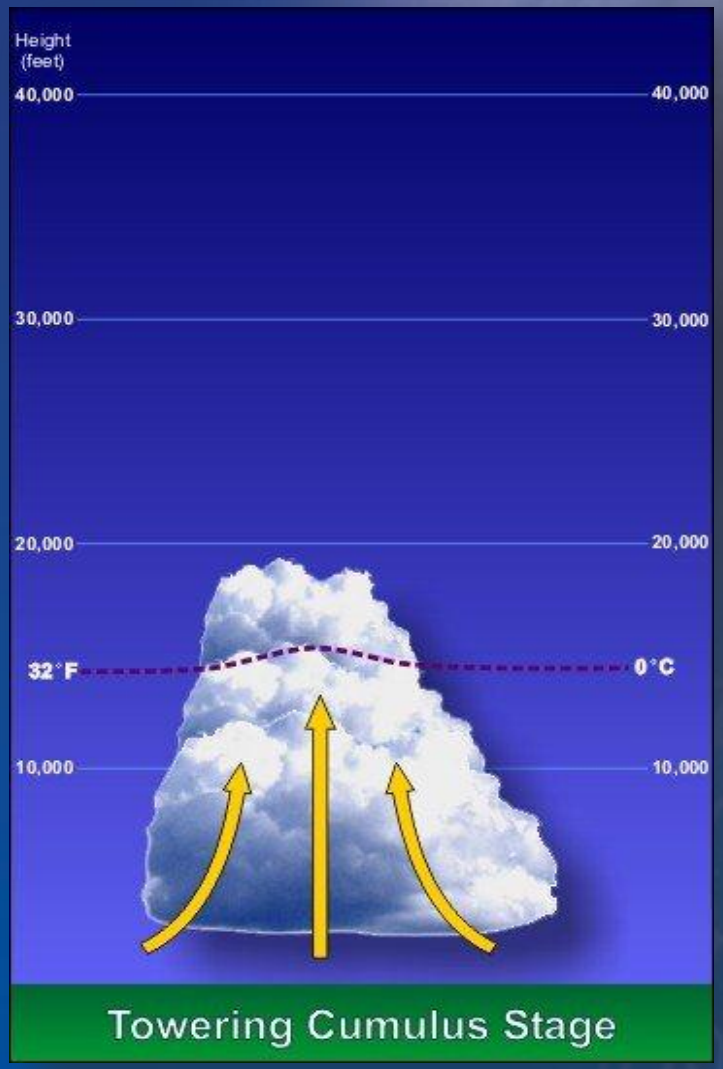
What Makes a Thunderstorm Severe?

- Tornado
- Winds at least 58 mph or reports of wind damage
- Hail at least 1 inch in diameter

Thunderstorm Life Cycle

Towering Cumulus - Developing

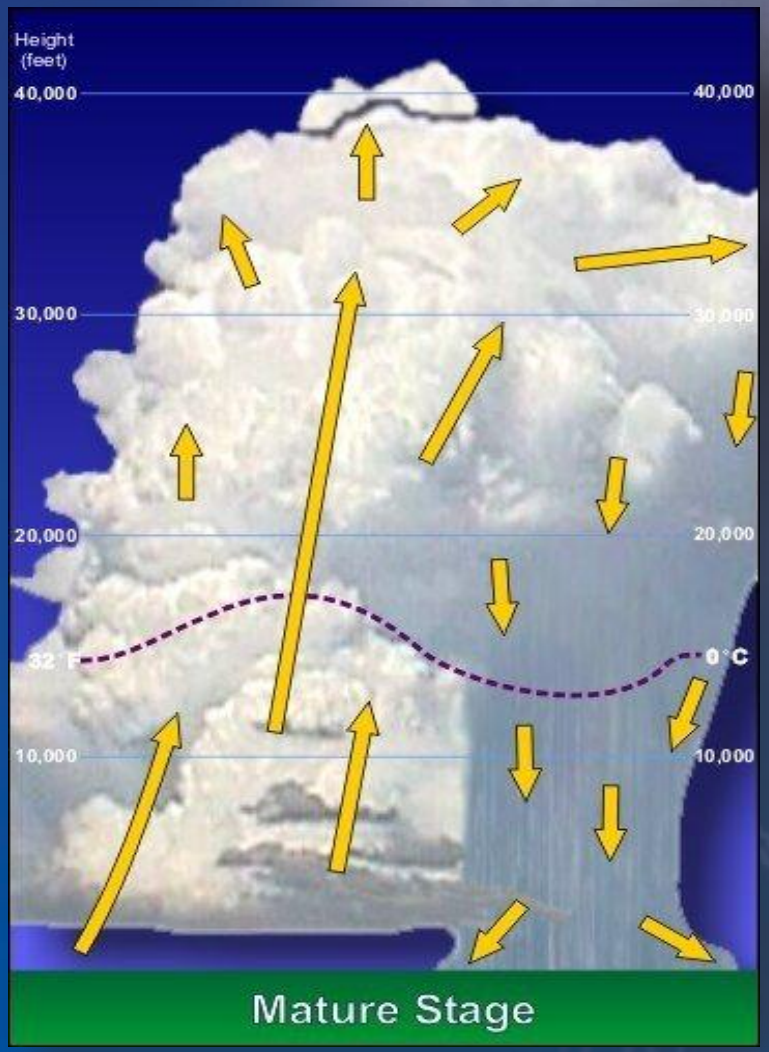
- Towering, billowy bright white clouds
- Dominated by updraft – rising air
- Lasts 10-15 minutes
- Little rain, but lightning possible



Thunderstorm Life Cycle

Mature Stage

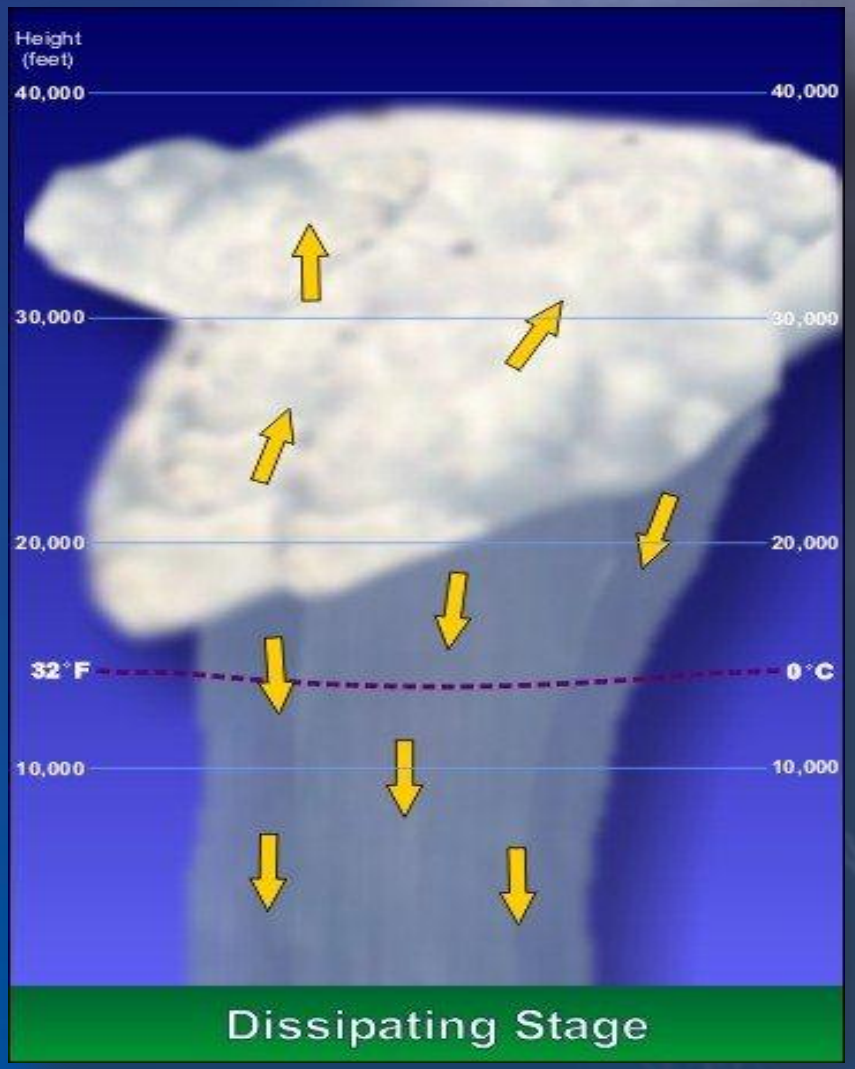
- The weather stage
- Hail, heavy rain, lightning, strong winds, tornadoes
- Anvil at storm top
- Rising air/falling rain (updraft/downdraft)
- Typically lasts 10-20 minutes



Thunderstorm Life Cycle

Dissipating Stage

- Tall, billowy updraft shrinking
- Mostly descending air
- Rainfall intensity decreases
- Strong wind and hail still possible from some storms
- Lightning can still be quite frequent
- Lifespan is 45-50 minutes

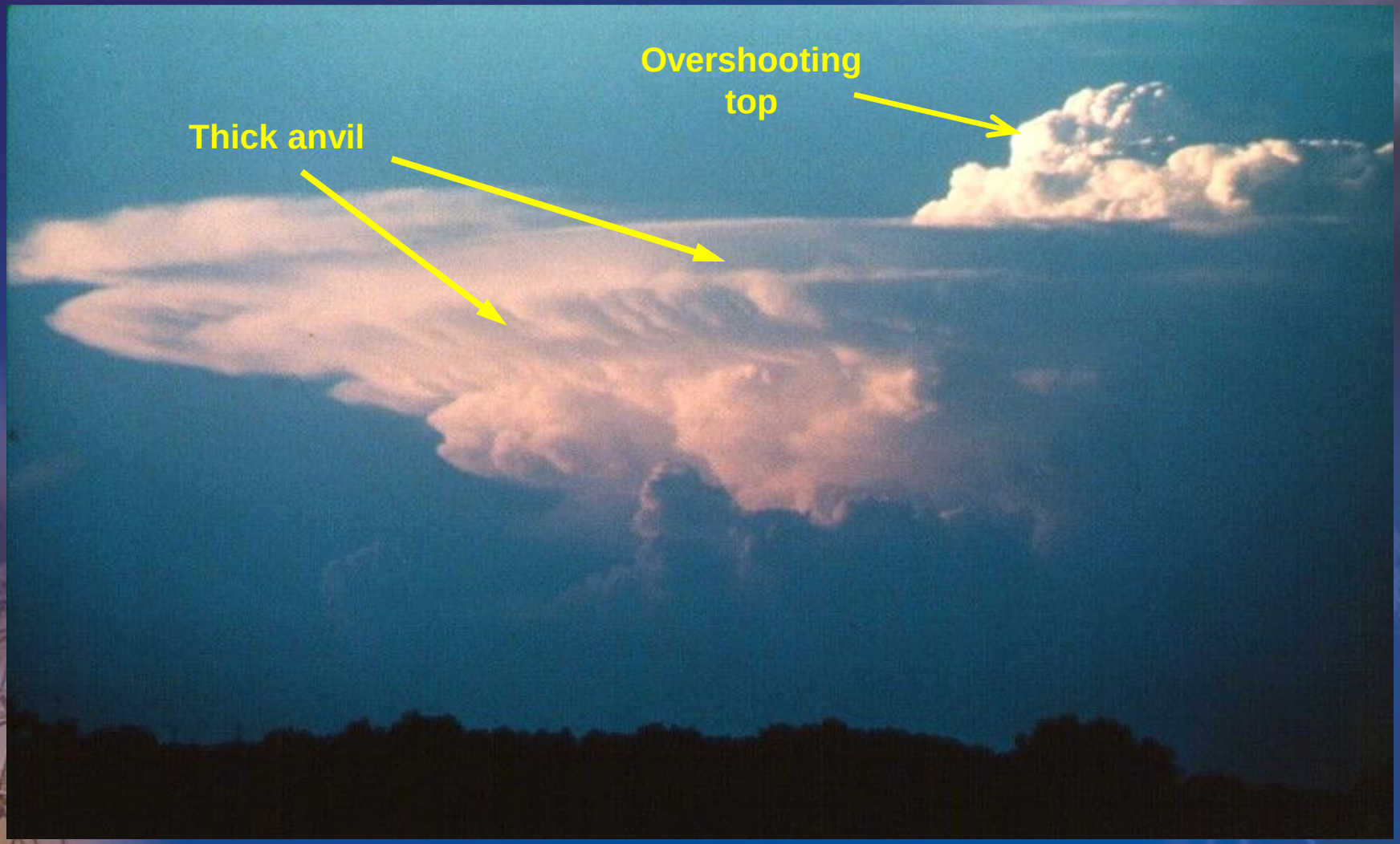


Observing Upper Level Storm Clues

Viewed 30-40 miles from storm

- **Overshooting Top**
  - Dome-like bubble of cloud extending above anvil and persisting for >10 minutes
  - Indicates strong updraft
- **Anvil characteristics**
  - Thick, cumuliform anvil with sharp, well-defined edges
  - ‘Bubbling’ look

Intensity clues – Overshooting Top



Intensity Clues - Anvil

Well defined anvil

Wispy anvil

Intensity clues - Updraft

Viewed 10-20 miles from the storm

Strong updraft

Hard cauliflower appearance

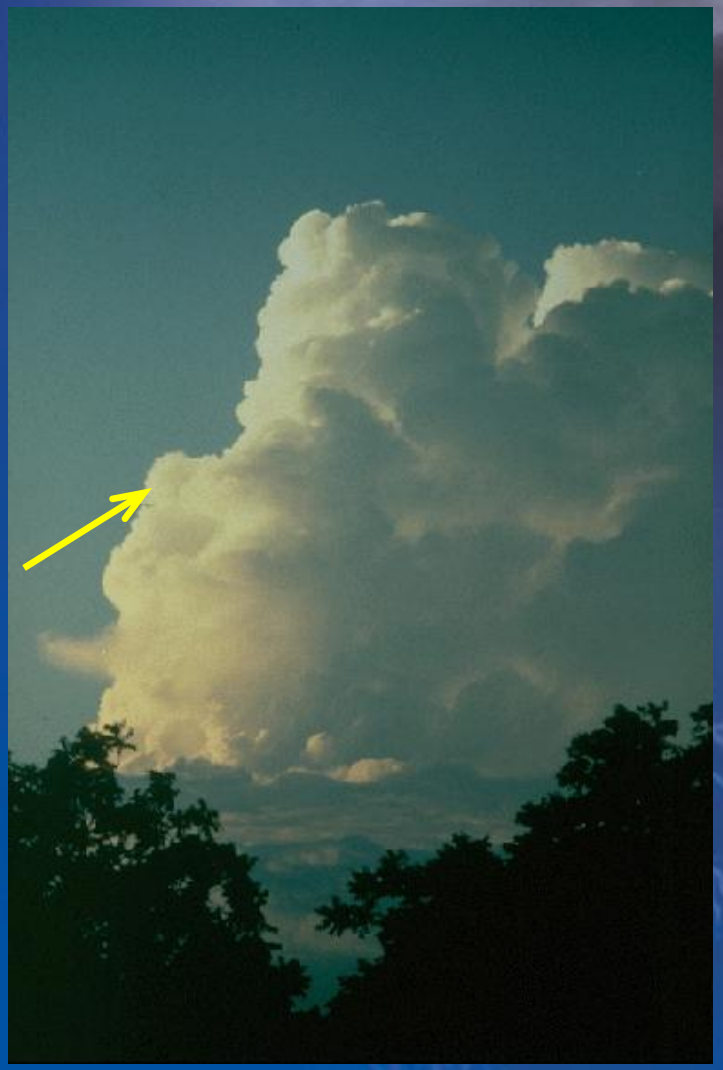
Vertically upright

Weak updraft

Soft, mushy appearance

Vertically tilted

Sunlight shining through



Observing Low Level Storm Clues

Viewed within 10 miles of storm

- **Wind clues**
  - Shelf Cloud/Roll Cloud
  - Downburst
- **Hail clues**
  - White hail shaft
  - Greenish tint to sky

- **Tornadoes, Funnel Clouds, and Wall Clouds**
  - Rain-Free Base (Low, flat cloud base with little visible precipitation falling and updraft towers above)
  - Wall Cloud (Isolated lowering of rain-free base, rotating, and usually near the north side of the updraft)

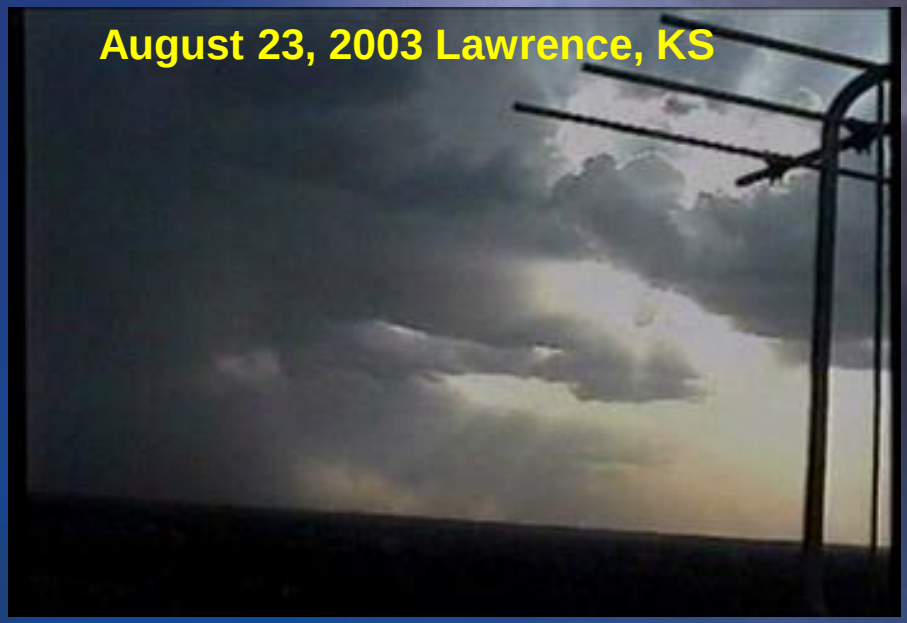
Fundamental Definitions – Shelf Cloud

- **Shelf Cloud** – Low level, *horizontal*, wedge shaped cloud, occurring on leading edge of a thunderstorm (Wind, rain, and hail may follow, but may not be severe)

Fundamental Definitions - Microburst

- **Microburst** – An intense downdraft from a thunderstorm with an outrush of damaging wind

- Winds can exceed 100 mph



Reporting Winds/Wind Damage

- Use Beaufort Scale to estimate wind speeds
  - ~50 MPH - Slight structural damage and large branches may break
  - ~60 MPH - Moderate structural and tree damage
  - ~ 70 MPH - Heavy to severe structural and tree damage

- Report immediately:
  - Wind damage
  - 50+ mph winds

Salt Lake County - September 4, 2007

Measure wind speeds when possible!

Hail Clues

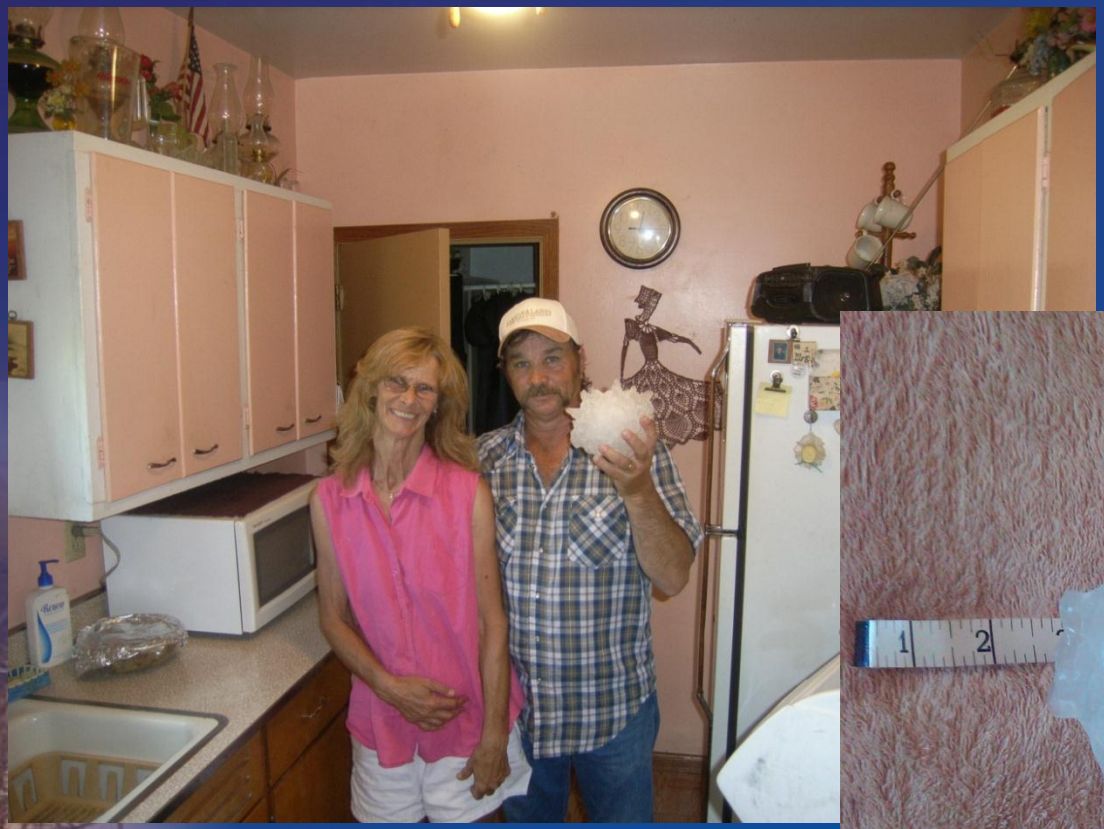
- **Look for**
  - White hail shafts/streamers
  - Greenish tint to sky

- **Report any size hail**

Measure the Hail

Measure the Hail

United States Record Hail (weight and diameter)
Vivian SD, July 23, 2010.



Do Not Report “Marble Size Hail”

Reference hail size in inches or relate it to the size of a coin.

Quarter (1 inch)

Nickel

Penny (3/4 inch)

Dime (11/16 inch)

Hail Boys

A Closer Look

Supercells, Tornadoes, Funnel Clouds, and Wall Clouds

Dunlap, IN - April 11, 1965

Yes…Tornadoes Do Happen in Utah!

Salt Lake City
August 11, 1999

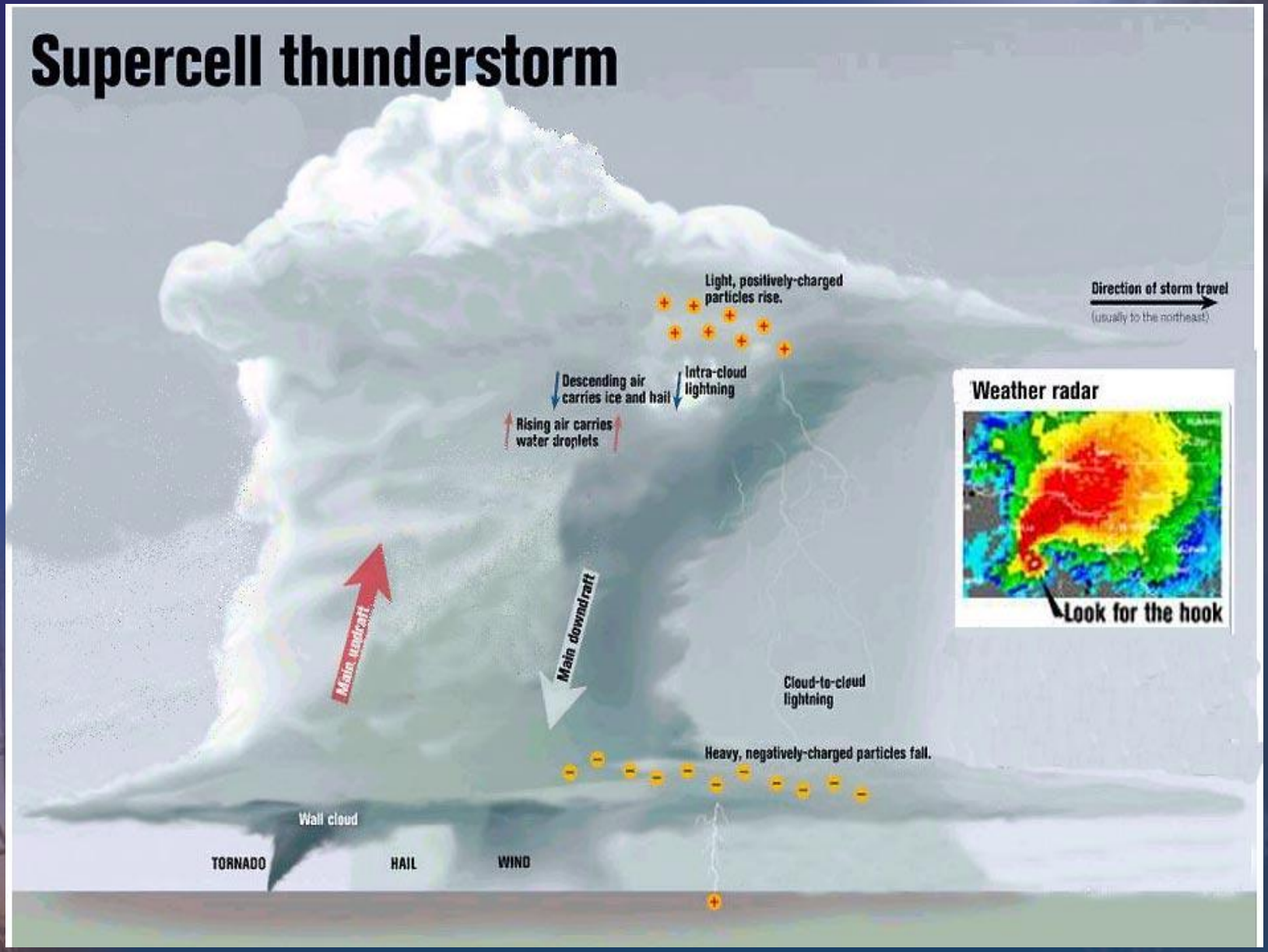
Manti
September 8, 2002

Fundamental Definitions – Supercell Thunderstorm

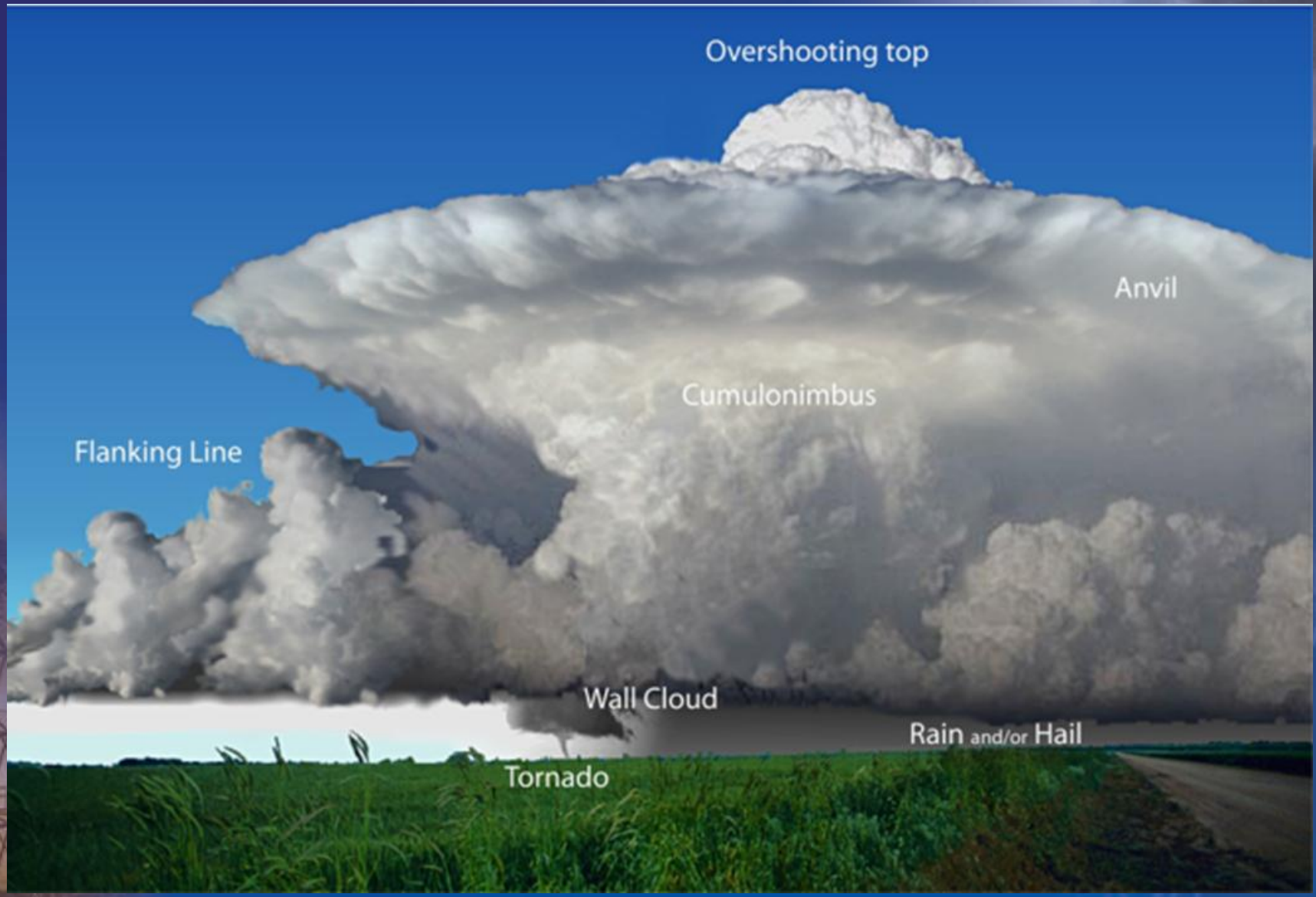
- **Supercell** – A thunderstorm with a persistent rotating updraft

- Almost always severe with large hail, damaging winds, and tornadoes

Supercell Depiction



Supercell Depiction – Second Look

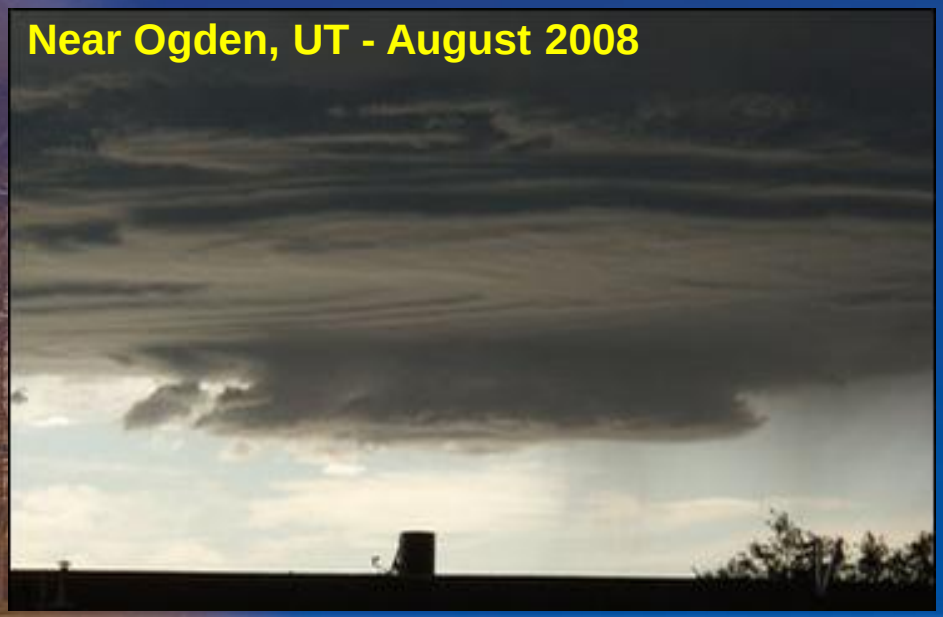


Fundamental Definitions - Mesocyclone

- **Mesocyclone – A storm-scale region of rotation within the updraft region of a supercell thunderstorm**

Fundamental Definitions – Wall Cloud

- **Wall Cloud** - An isolated lowering under a rain-free cumulonimbus cloud base, resembles a pedestal.
- Persistent (5-10 minutes) and often rotating
- Can precede funnel cloud and tornado formation



Shelf Clouds vs. Wall Clouds

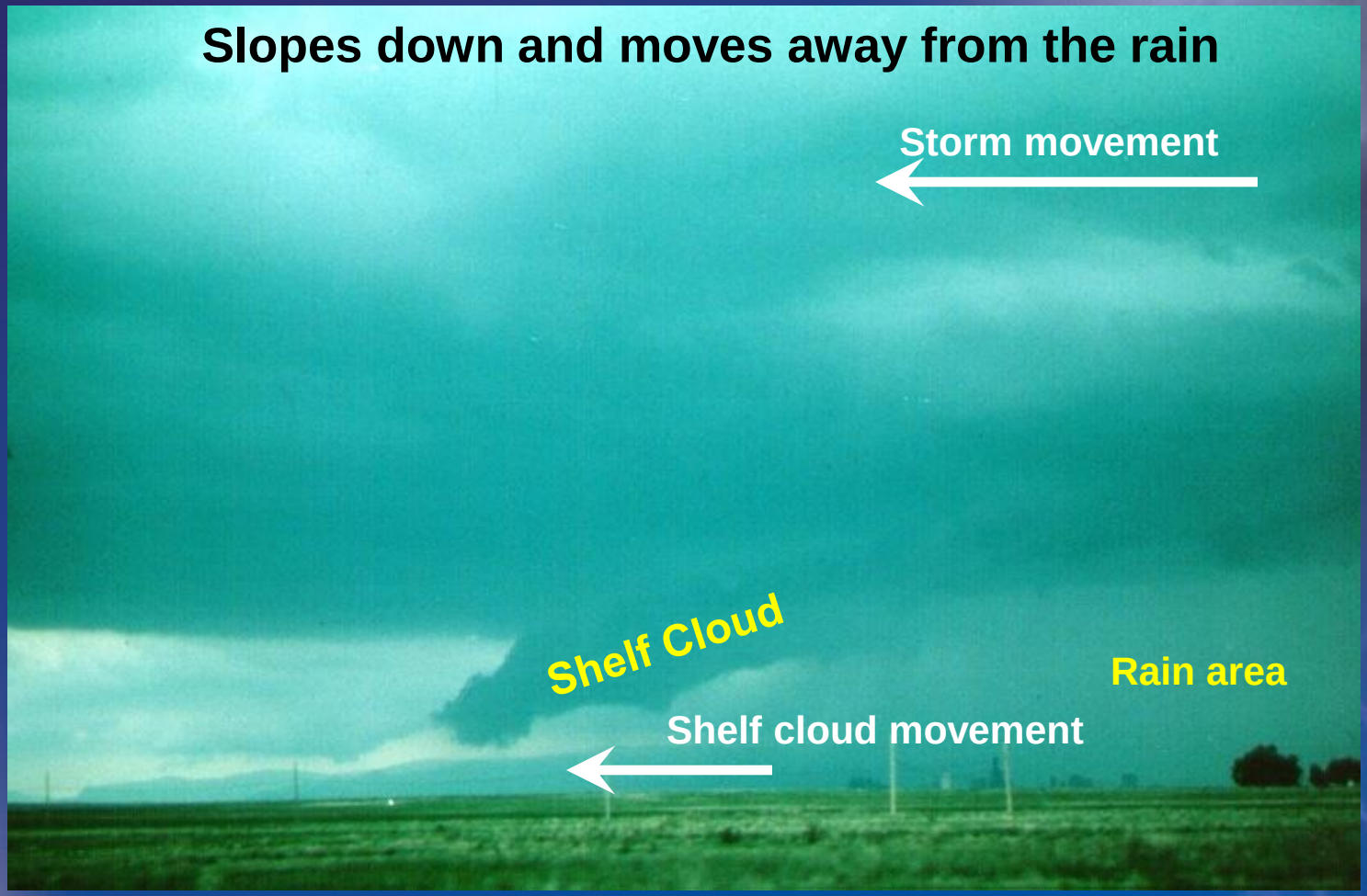
Shelf Clouds

- Suggest downdraft/outflow
- Move away from precipitation areas
- Horizontally orientated and can extend for miles, may ‘roll’ like a rolling pin

Wall Clouds

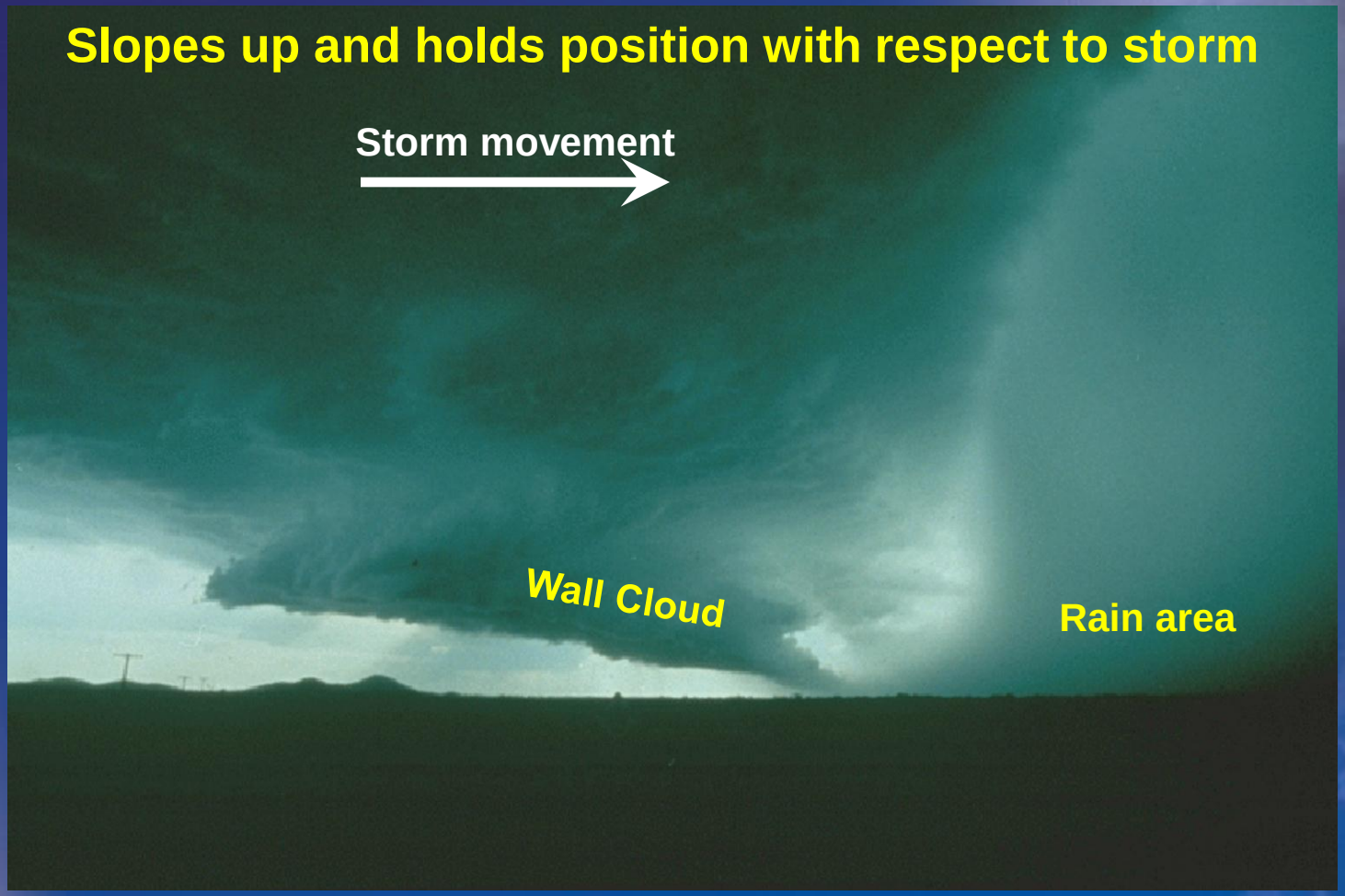
- Suggest updraft/inflow
- Maintain position with respect to precipitation
- Isolated, vertically orientated, *and rotating, like a spinning skater*

Shelf Cloud



The Shelf Cloud is the leading edge of the wind shift

Wall Cloud



The wall cloud does not move away from the rain

Fundamental Definitions – Funnel Cloud

- **Funnel Cloud - A violently rotating column of air, extending downward from the base of a thunderstorm that *does not* reach the ground**

- **No circulation is seen on the surface**

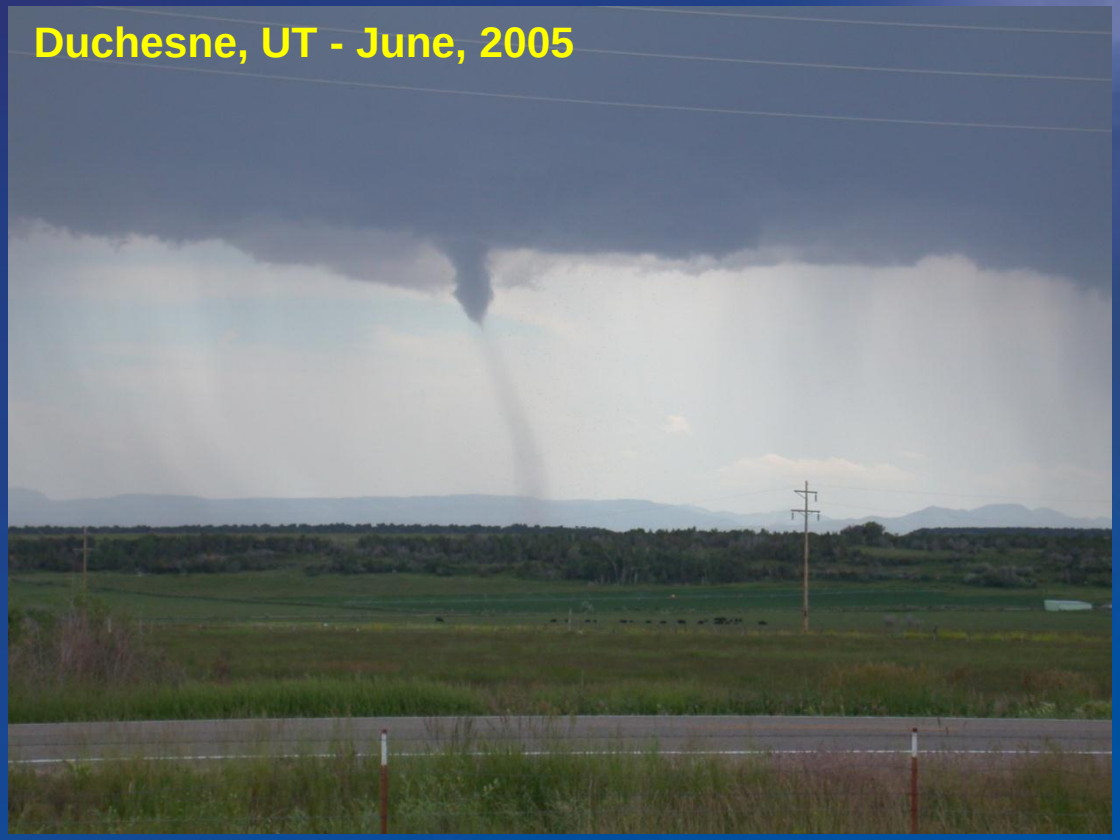
Fundamental Definitions - Tornado

Tornado - A violently rotating column of air extending from the base of a severe thunderstorm to the ground

Platte/Colfax Counties Nebraska

Funnel Cloud and Initial Tornado

Development Stage



Tornado – Mature Stage

Look-alikes
Don't Be Fooled!

- **Scud Clouds** - Ragged edge clouds that ***do not*** rotate and are located below the main cloud base…may move up and into cloud base under an updraft

- **Virga** - Rain falling from clouds, but evaporating before reaching the ground…NO rotation, but can imply microburst winds

Night Severe Weather Spotting

What to look and listen for

- Utilize illumination provided by lightning
- If experiencing large hail, you are near the portion of a storm where a tornado may form
- Search horizon for bright flashes of light from power lines and transformers being hit by a tornado

- Listen for a loud roaring sound (not present with all tornadoes and may be from straight line winds)

Lightning Safety

- Monitor NOAA Weather Radio All Hazards, your favorite news source, and/or NWS web sites for vital weather information
- Keep and eye on the sky and listen for the sound of thunder

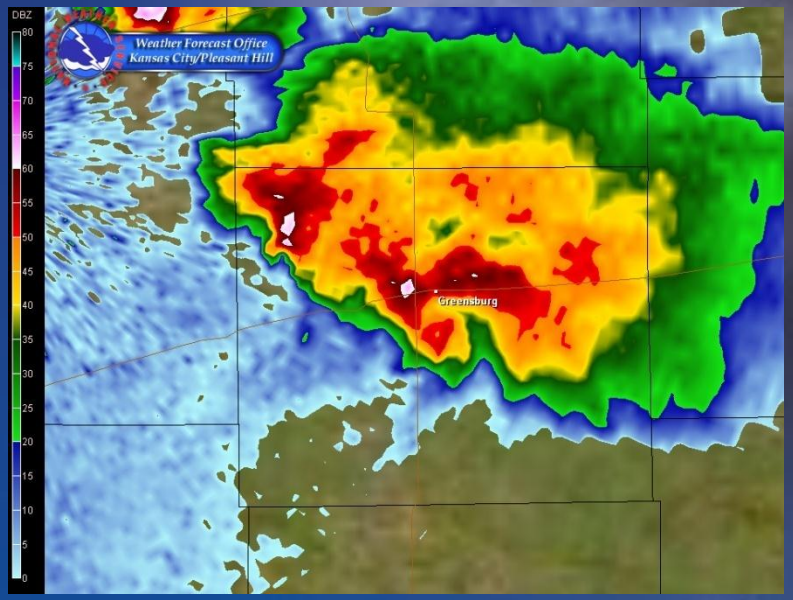
If you can hear thunder, go to a safe shelter immediately!

- If you can't get to a safe shelter, stay away from trees and other tall objects
- Avoid leaning against vehicles
- Get out of or off the water

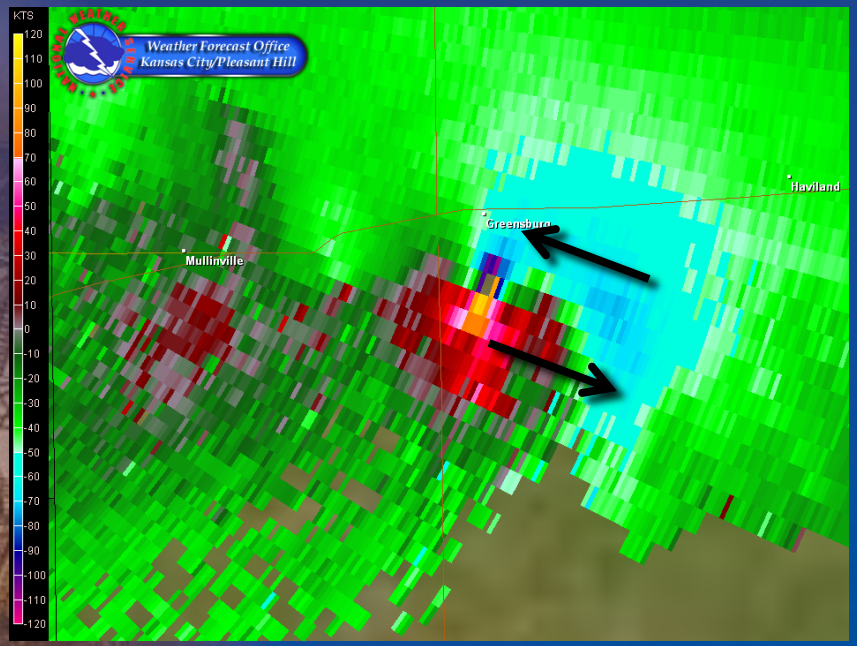
Radar Interpretation 101

Doppler radar data available from NWS web pages

Reflectivity - Hot colors
= more intense echoes



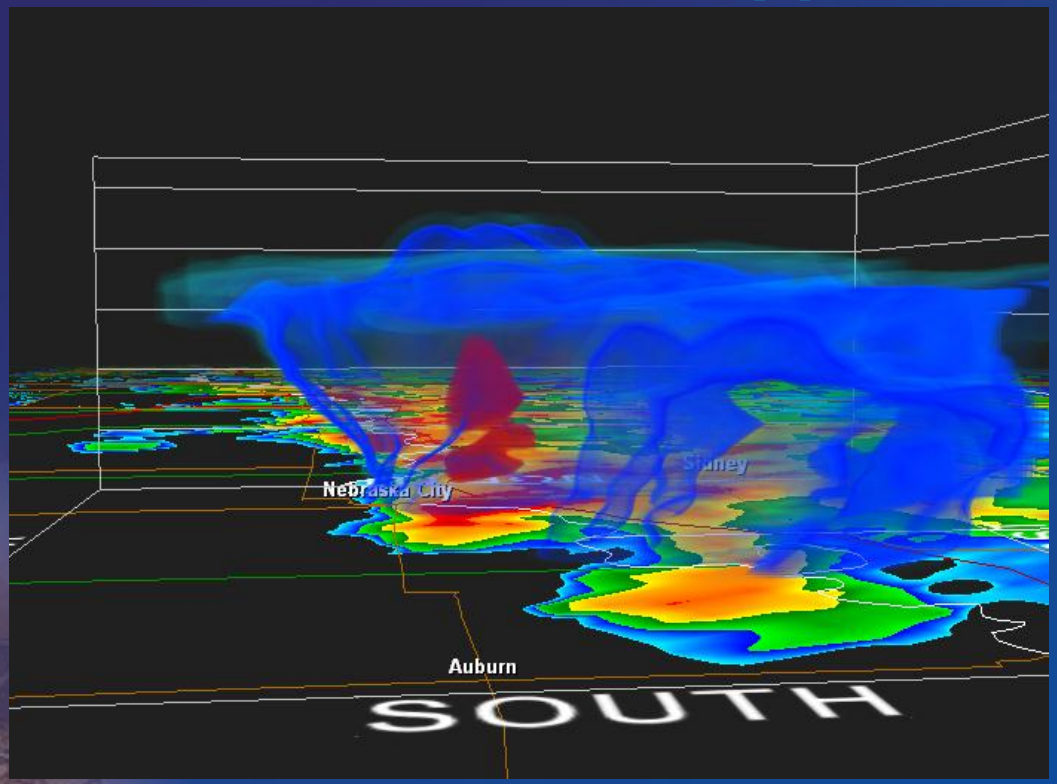
Greensburg, KS EF-5 May 4, 2007

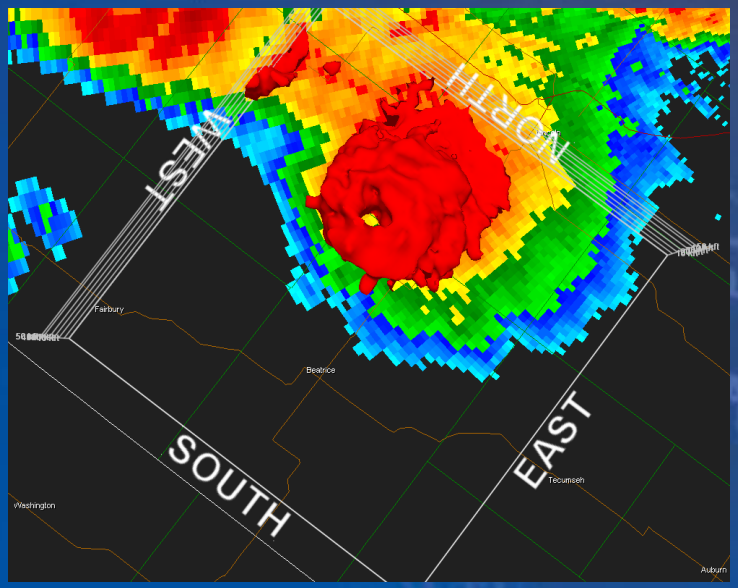


Velocity - Warm colors indicate winds directed away from radar and cool colors winds directed toward radar

Radar Interpretation 101

Doppler in 3-D





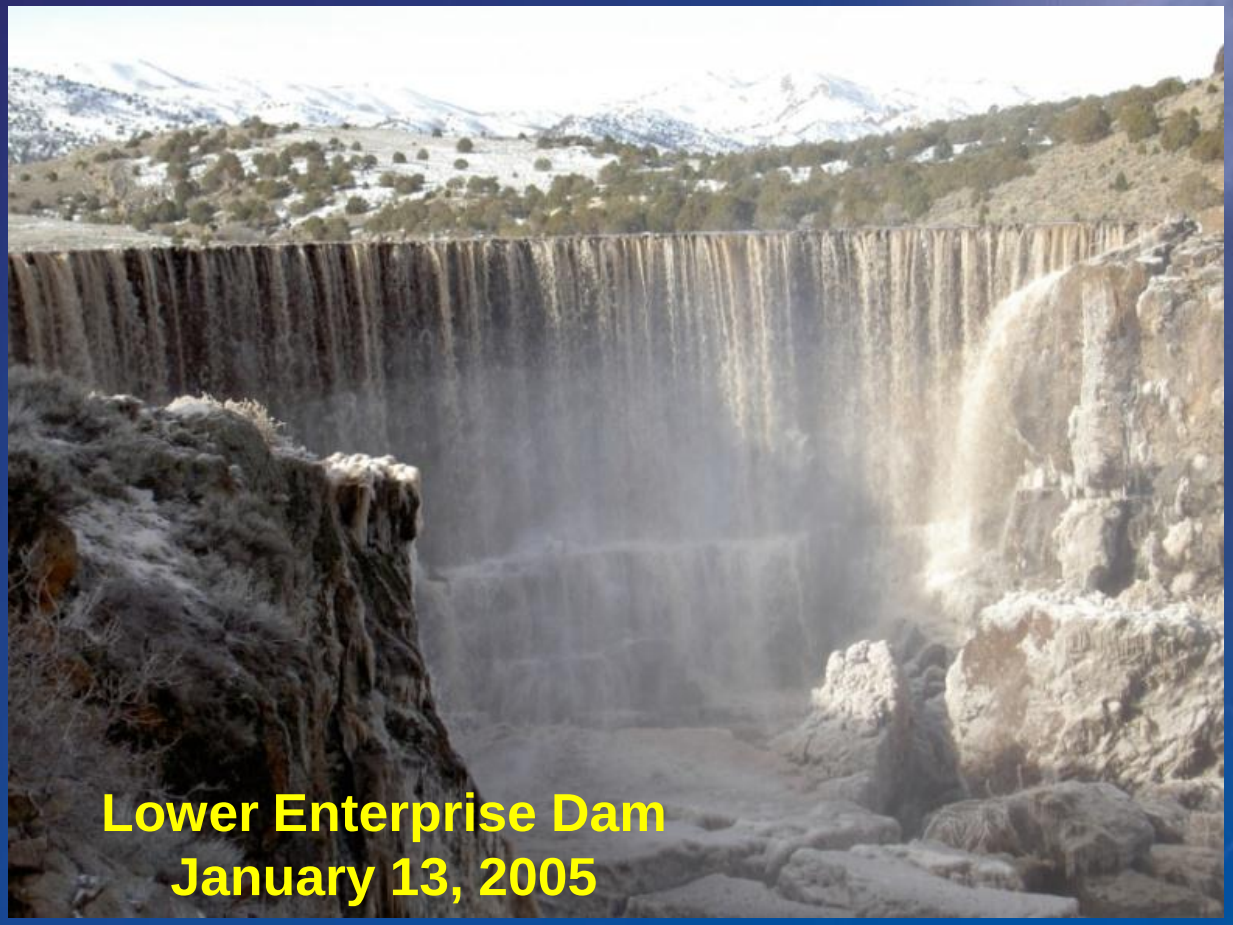
Remember…
We Want To Hear From You When the Following Is Observed…

- Tornado
- Funnel Clouds and Wall Clouds
  - Rotating and persistent
- Strong or damaging winds
- Hail (any size)

Don’t assume that we already know it’s happening!

Switching Gears…

Flooding/Flash Flooding



Flooding/Flash Flooding

Respect the water…and think!

Near El Paso, Texas- June 20, 1999

Flooding/Flash Flooding Terms

What to watch for

- Hazardous Weather Outlooks/Special Weather Statements
- Flash Flood Potential Rating
- Watches
- Warnings
- Advisories

Flooding/Flash Flooding Reporting

REPORT THE FOLLOWING IMMEDIATELY!

- Flooding or rapidly rising water
  - Unusually high or flowing faster than normal
  - Water approaching bankfull or nearing roads/structures
  - Inch or more of rainfall observed in a short duration
    (less in steep/rocky terrain or in burn areas)
  - Any flooding observed
  - Debris flows or rock slides

Watch for extended periods of heavy rainfall from slow moving thunderstorms, or thunderstorms 'training' over the same locations

Report water as it begins to rise and before it starts to impact people's lives

Don't assume that we already know it's happening!

Marine Weather

Marine Weather Terms

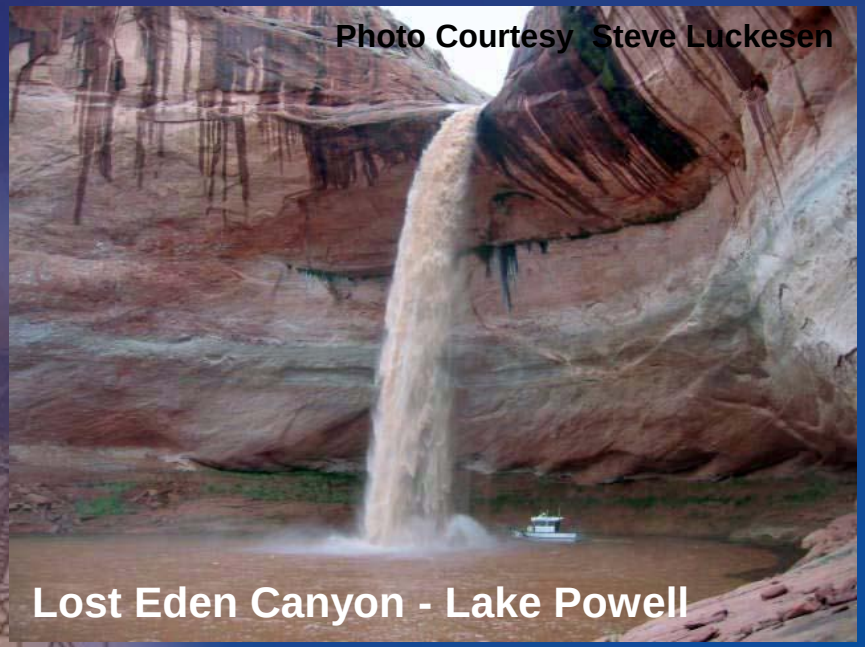
What to watch for

- Hazardous Weather Outlooks/Special Weather Statements
- Watches
- Warnings
- Advisories

Marine Weather Reporting

Report the following:

- **Winds and waves impacting craft**
- **Waterspouts**
- **Dense fog**



Fire Weather

Salt Creek Fire – July 2007

Fire Weather Terms

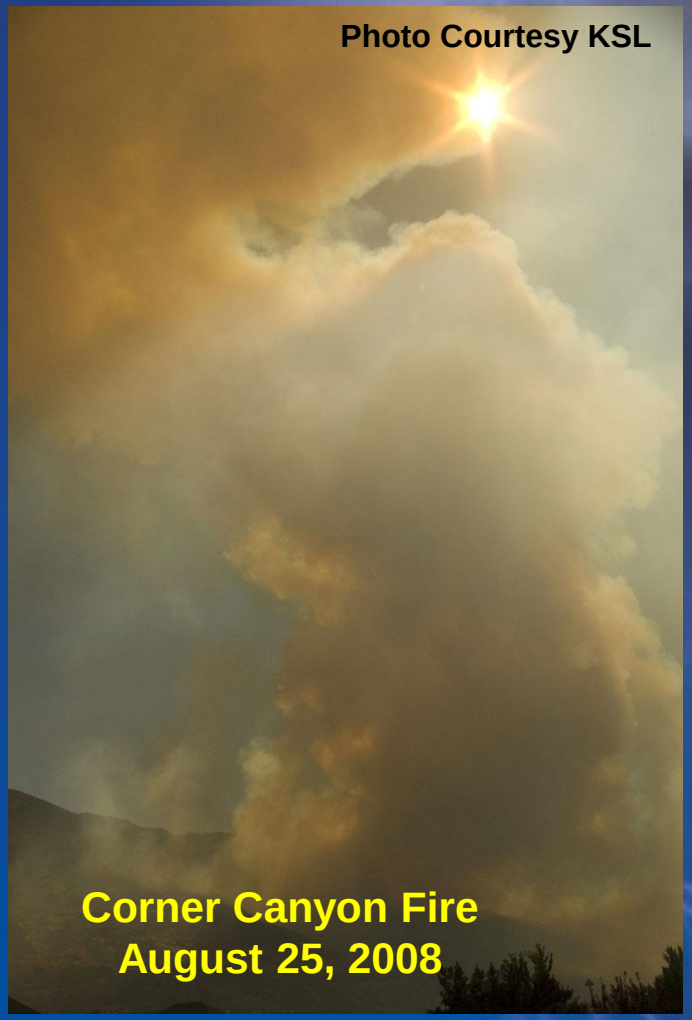
What to watch for

- Hazardous Weather Outlooks
- Watches
- Warnings

Wildfire Reporting

REPORT THE FOLLOWING!

- New wildfire starts, especially if threatening life and property
- Smoke reducing visibility to less than 2 miles
- Weather pattern information (afternoon wind shifts) in wildfire locations (provides insight to forecasters)



Winter Weather

Elk Point Avalanche

Winter Weather Terms

What to watch for

Cedar City Doppler Radar
Blowhard Mountain

- Hazardous Weather Outlooks/Special Weather Statements
- Watches
- Warnings
- Advisories

Winter Weather Reporting

Report the following:

- **Snowfall accumulations**
  - **–How much total snow fell (period of time)**
  - **–When snow began/ended**
  - **–When snow total reached warning level**
- **Snow depth**
- **Freezing rain accumulation**
- **Precipitation type changes**

Draper - February 2008

Safety - ACES

- Awareness
- Communication
- Escape Routes
- Safe Zones

Share Your Information!

Severe Weather Spotter Line:
800-882-1432 x1

Submit a Storm Report
http://www.srh.noaa.gov/StormReport/SubmitReport.php?site=slc

Spotter Reports E-mail:
utah.spotter@noaa.gov

Twitter
@NWSSaltLakeCity
http://twitter.com/#!/NWSSaltLakeCity
http://www.nws.noaa.gov/stormreports

Facebook
US National Weather Service Salt Lake City Utah
http://www.facebook.com/US.NationalWeatherService.SaltLake.gov

Call for Video and Photos

If you are in a SAFE location and have the chance to shoot video/pictures, please share it with us for inclusion in future presentations

Additional Training

- **SKYWARN® Spotter Training**
  - **Role of the Skywarn Spotter**
  - **Skywarn Spotter Convective Basics**
- **Available at https://www.meted.ucar.edu/training_course.php?id=23**
- **The COMET® Program - MetEd**

Contact WFO SLC

Kevin Barjenbruch
Warning Coordination Meteorologist
kevin.barjenbruch@noaa.gov

National Weather Service Salt Lake City
2242 West North Temple
Salt Lake City, UT 84116
http://www.weather.gov/saltlakecity

UTAH AND SOUTHWEST WYOMING WEATHER SPOTTER HOME PAGE
http://www.wrh.noaa.gov/slc/spotter/spotter_home.php

Thanks for coming – you've weathered the storm!

Questions?